Filed 3/16/98

PATENT
Attorney Docket No.: 9113-2 DI1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re:	Patent application of Randell L. Mills	:	
		:	Group Art Unit:
Serial No.:	08/467,911	:	3641
Filed:	June 6, 1995	:	Examiner: H.E. Behrend
For:	ENERGY/MATTER CONVERSION METHODS AND STRUCTURES	:	

DECLARATION OF ROBERT M. SHAUBACH AND NELSON J. GERNERT UNDER 37 C.F.R. 1.132

Robert M. Shaubach, residing at 1104 Brunnerville Rd., Lititz, Pennsylvania declares and states that:

1. I received a Bachelor of Science degree in electrical engineering from Union College, Schenectady, New York, 1967, and attended graduate nuclear engineering courses at Catholic University, Maryland.

2. I was a Manager, Development Operations, at Thermacore, Inc., located at 780 Eden Road, Lancaster, PA 17601. I was with Thermacore from 1981 to 1995.

3. As manager of the Development Operation, I am responsible for Thermacore's contract and in-house developments in the heat transfer field. I am responsible for seeing that Thermacore maintains technical excellence in development programs while meeting budget and schedule constraints.

4. I have been instrumental in furthering the understanding of the performance of sintered wick structures both self-pumped and mechanically augmented. This includes modeling two phase flow in wicks and helping to develop vapor resistant arteries. This new understanding has led to several patents as well as setting the World's record in heat pipe heat flux levels of over 100 kW/cm^2.

5. My professional career has been devoted primarily to the energy field. This includes structural and thermal analysis and experimental work covering laser mirror coolers, heat pipes, sintered wick structures, two phase flow and heat transfer, thermally driven pumps, absorption coolers, air/air heat exchangers and resolution of technical problems with Naval and commercial ship propulsion and auxiliary systems as well as nuclear and fossil generating plants and industrial processes. My experience covers project engineering and management through corporate responsibility for research, development and engineering.

6. My previous work includes the development of heat pipes for cooling hypersonic aircraft wing and cowl leading edges, heat pipes for fuel cell coolers, and articulated heat pipe/heat pipe joint for the Air Force, and the development of double effect absorption heat pump heat exchangers for a commercial customer.

7. I have made significant contributions to the development of a unique gas fired pump for a solar augmented gas fired hot water system and an air/air heat exchanger for the commercial market.

8. I have designed the laser mirror heat pipe cooler for the Air Force and performed the thermal/optical distortion analyses for the silicon heat pipe laser mirror cooler on Contract No. F33615-82C-5127.

9. I am the author or co-author of numerous technical reports and papers, of which selected publications are shown in the attachment.

Nelson J. Gernert residing at 6016 Schoolhouse Road, Elizabethtown, PA declares and states that:

1. I received a B.S. in mechanical engineering from Pennsylvania State University in 1983.

2. I am currently a Development Engineer/Group Leader at Thermacore, Inc., located at 780 Eden Road, Lancaster, PA 17601. I have been with Thermacore since 1983.

3. At Thermacore, I have worked on research and development contracts directly related to heat transfer technology.

4. I am currently the principal investigator on the Thermacore Research and Development effort evaluating the performance of Dr. Randell Mills' Electrolytic Power Cell.

5. I have been the principle investigator on numerous contracts and as a result I have extensive experience in conducting contract R&D. A brief summary of these contracts is provided in the attachment.

6. I am the author or co-author of numerous technical reports, papers, of which selected publications are shown in the attachment.

Robert M. Shaubach, and Nelson J. Gernert together declare and state that:

1. We have reviewed and understand the concept covered by the subject U.S. application No. 07/825,845 of Dr. Randell L. Mills and we are personally familiar with the methods and apparatus disclosed therein.

2. We (hereinafter Thermacore) have conducted independent experiments on nominally identical apparatus to that made by Dr. Randell Mills (Hereinafter HPC) to check HPC's method and results, since March of 1992.

3. Thermacore's experiments and test results have corroborated HPC's results, showing 78 watts of heat output with only 28 watts of heat input. Excess energy on the order of 50 watts has been produced reliably and continuously over the last several months. Thermacore's spectral metallurgical evaluations show that neither the electrolyte nor the electrodes are being consumed. Scintillation counter measurements show no signs of radiation external to the cell.

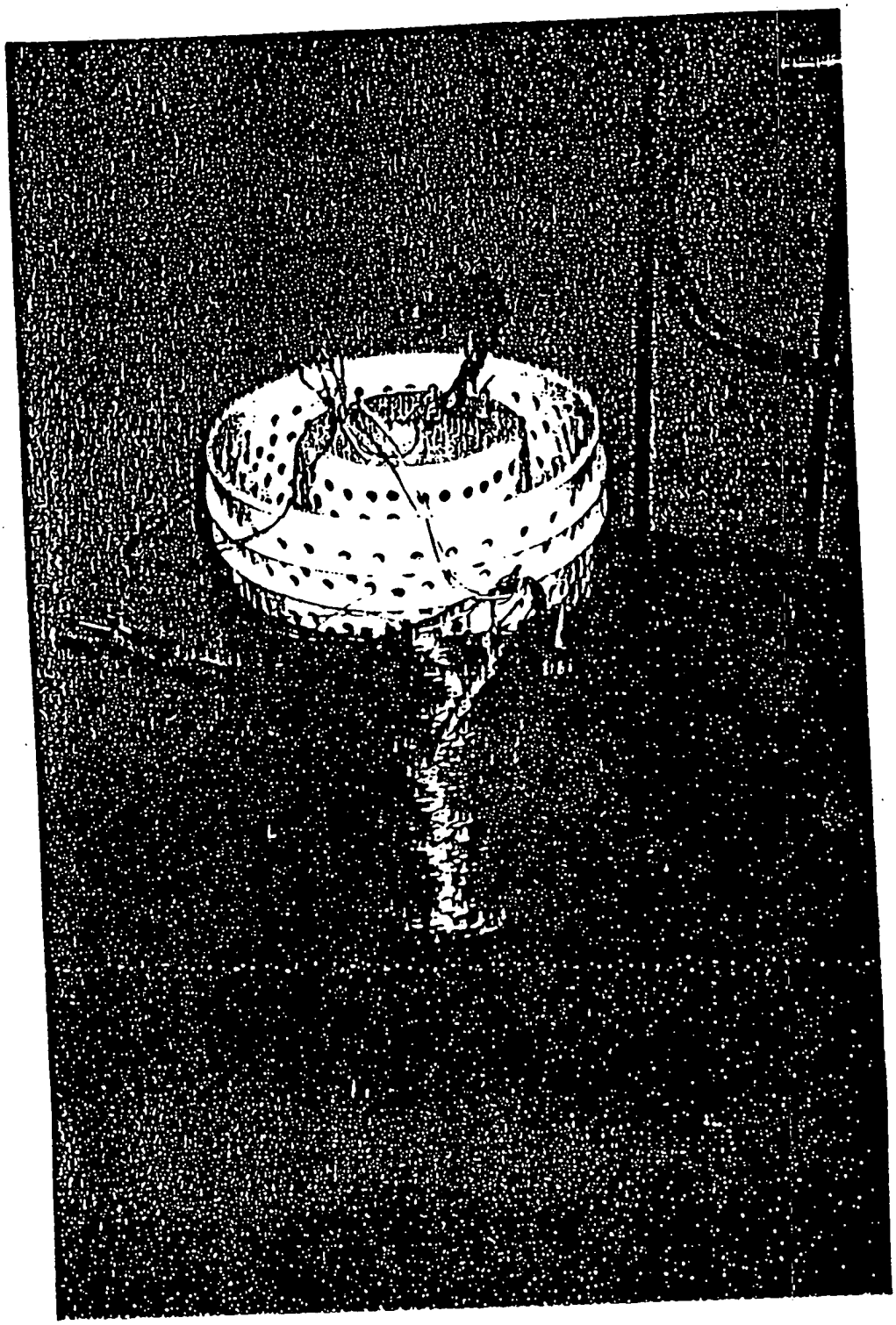
Description of the Thermacore Cell

The Thermacore cell is comprised of a 38 liter (33 cm diameter x 53 cm high) Nalgene tank (Model #54100-0010). Two 4 inch long by ¼ inch diameter terminal bolts were secured in the lid, and a cord for a heater was inserted through the lid.

The cathode is comprised of 1) a 19 liter polyethylene bucket which served as a perforated (mesh) support structure where 1.3 cm holes were drilled over all surfaces at 1.9 cm spacings of the hole centers and 2) 5000 meters of 0.5 mm diameter nickel wire (NI 200 0.0197", HTN36NOAG1, AI Wire Tech, Inc.). The wire was wound around the outside of the mesh support at about 150 sections of 33 meter length. The ends of each of the 150 sections were twisted to form three cables of 50 sections per cable. The cables were pressed in a terminal connector which was bolted to the cathode terminal post. The connection was covered with epoxy to prevent corrosion. See Figure 1. A center cathode was also made from 5000 meters of the 0.5 mm diameter nickel wire. The wire was wound in a toroidal shape with three cables pressed into a terminal connector which was bolted to the cathode terminal post and epoxy coated. The cathode was inserted into an ellipsoidal shaped perforated polyethylene container.

The anode is an array of 15 commercially available, chemically inert platinized titanium anodes (10 - Engelhard Pt/Ti mesh 4 cm x 20 cm with one 1.9 cm by 17.7 cm stem attached to the 4 cm side plated with 100 μ Pt series 3000). A 1.4 cm wide tab was made at the end of the stem of each anode by bending it at a right angle to the anode. A 0.64 cm hole was drilled in the center of each tab. The tabs were bolted to a 31 cm diameter polyethylene disk (Rubbermaid Model #2666) equidistantly around the circumference. Thus, an array was fabricated having the 15 anodes suspended from the disk. The anodes were bolted with 0.64 cm polyethylene bolts. Sandwiched between each anode tab and the disk was a flattened nickel cylinder also bolted to the tab and the disk. The cylinder

gure 1. NICKEL WIRE CAT..(E



was made from a 7.5 cm x 9 cm long x 0.125 mm thick nickel foil. The cylinder traversed the disk, and the other end of each was pressed about a 10 AWG/600 V copper wire. The connection was sealed with shrink tubing and epoxy. The wires were pressed into three terminal connectors and bolted to the anode terminal. The connection was covered with epoxy to prevent corrosion. See Figure 2 for the anode and Figure 3 for the assembly.

Before assembly, the anode array was cleaned in 3 M HCL for 5 minutes and rinsed with distilled water. The cathode was rinsed with distilled water. The anode was placed in the cathode support and the electrode assembly was placed in the tank containing electrolyte. The power supply was connected to the terminals with automotive battery cables.

The electrolyte solution comprised 36 liters of 0.57 M K_2CO_3 (Alfa K_2CO_3 99%).

The heater comprised a 69 ohm 1000 watt cartridge heater which was suspended from the polyethylene disk of the anode array. It was powered by an Invar constant power (±0.1%) supply (Model #TP 36-18). The voltage (±0.1%) and current (±0.1%) were recorded with a Fluke 8600A multimeter.

Electrolysis was performed at 16, 25 and 50 amperes direct current with a constant current (±0.2%) power supply (Kepco Model #ATE 6-50M). A 75 amp condition was achieved using two Kepco Model #ATE 6-50M power supplies in parallel. They were also programmed to provide a square wave at a peak of 101.5 amps when driven by a frequency generator set at a 7% duty cycle at 2 Hz.

Figure 2.
TINUM COATED TITANIU[illegible]ODES

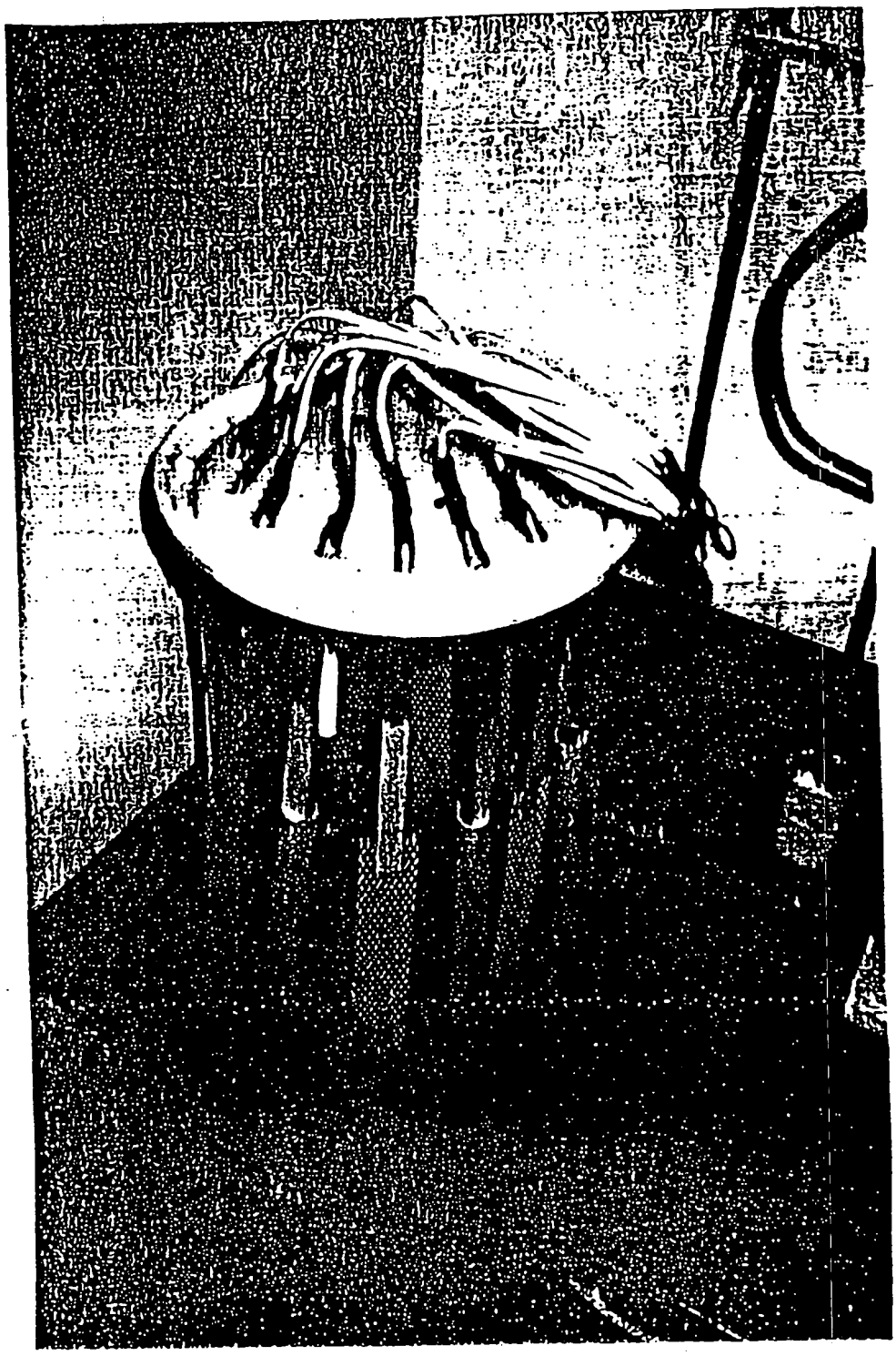
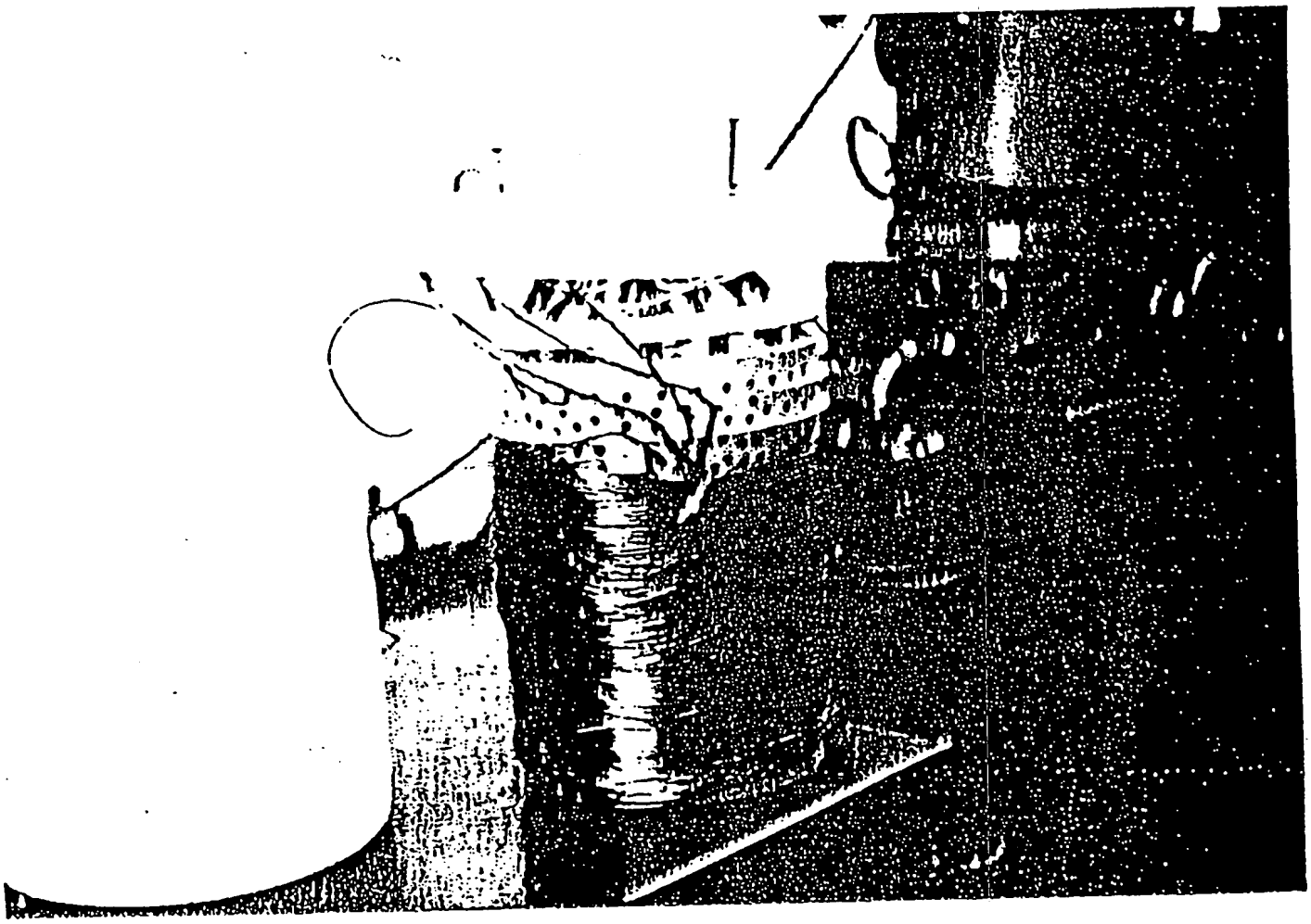


Figure 3. Cell Assembly



The voltage (±0.1%) was recorded with a Fluke 8600A multimeter. The current (±0.5%) was read from an Ohio Semitronics Current Transducer Model CTA101.

The temperature (±0.1°C) was recorded with a microcomputer thermometer (Omega HH21) which was inserted through a 0.64 cm hole in the tank lid and anode array disk.

The temperature (ΔT=T (electrolysis only) - T(ambient)) and the electrolysis power were recorded regularly. The heating coefficient was determined "on the fly" by the addition of 20 watts of heater power at 72 hour increments where 24 hours was allowed for steady state to be achieved. The temperature ΔT_2=T (electrolysis + heater) - T(ambient) was recorded as well as the electrolysis power. The ambient temperature was measured from a blank cell that was comprised of a closed 10 gallon Nalgene tank (Model 541000-0010) containing 40 liters of H_2O placed 0.5 meters from the electrolysis cell. Figure 4 shows the electrolysis cell on test.

Results

Both HPC and Thermacore obtained similar results on separate nominally identical cells using separate instrumentation. A heat balance is shown in Figure 5; some of the Thermacore results are shown in Table 1.

Figure 4.

ELECTROLYTIC CELL ON FLOAT

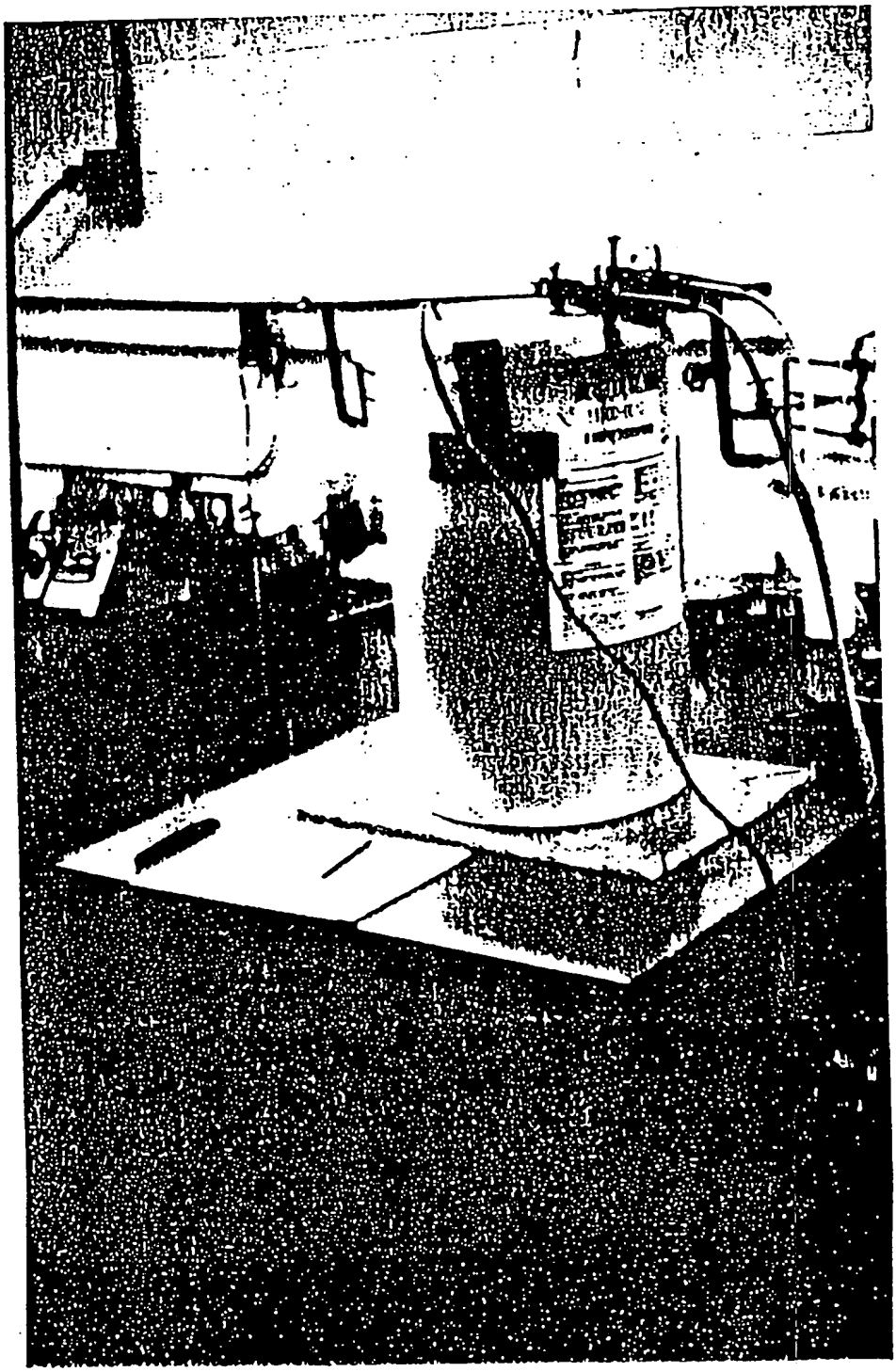


FIGURE 5. CELL HEAT BALANCE

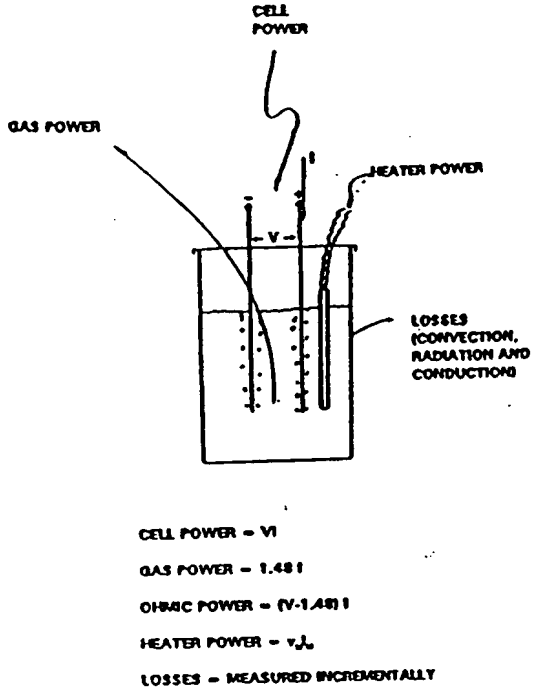


TABLE 1. Summary of Thermacore Test Results

Input Conditions			Output Conditions				Output / Input
V (Volts)	I (Amps)	Total Input Power = VI (Watts)	Total Output Power (Watts)	Subcomponents (Watts)			
				Gas 1.48I	Excess ± 20%	Ohmic Heating = (V-1.48)I	
2.96	25.1	74.3	124	37.1	50	36.9	1.7
3.25	49.9	162	212	73.8	50	88.2	1.3
3.42	75.0	257	307	111	50	146	1.2
3.98	101.5*	28.3	78.3	10.5	50	17.8	2.8

* Pulsed with a square wave at a 7% duty cycle @ 2.0 Hz

The method for calculating the 50 watts of excess power is represented graphically in Figure 6 for the 50 amperes direct current (ADC) case. The electrolyte temperature rise above ambient is plotted versus heat added to the electrolyte. A straight line is projected through the data to the ordinate. The intercept and slope of this line is used to estimate the 50 watts of excess power as shown in Figure 6.

Figure 7 shows the data for 16, 25 and 75 amps direct current superimposed on the curve for 50 amps. Notice that the excess energy of about 50 watts is independent of the cell current between 25 and 75 amps. The excess energy begins to drop off at current levels below 25 amps. Figure 8 also includes temperature versus

FIGURE 6. METHOD FOR CALCULATING EXCESS POWER

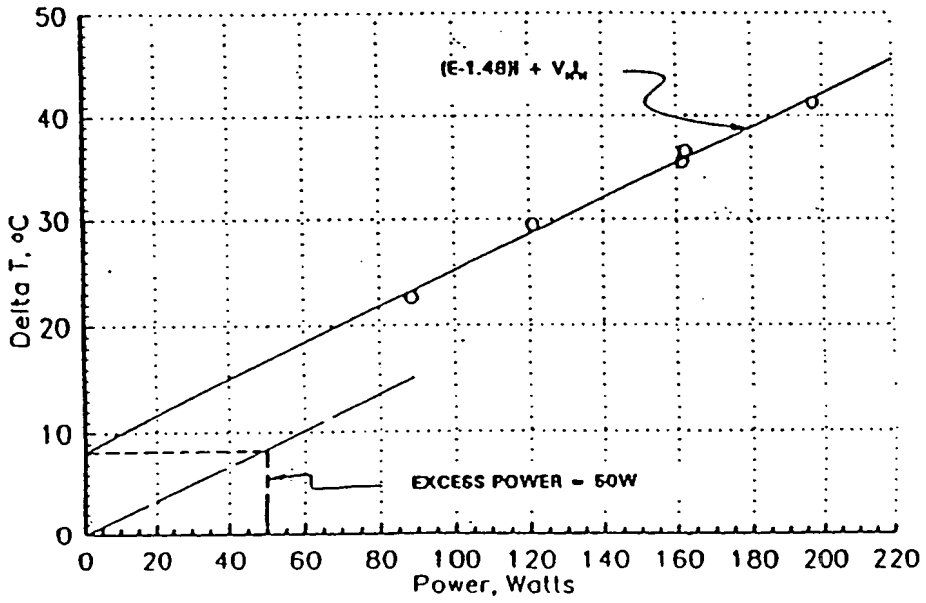


FIGURE 7. ELECTROLYTIC CELL COMPARED TO BLANK

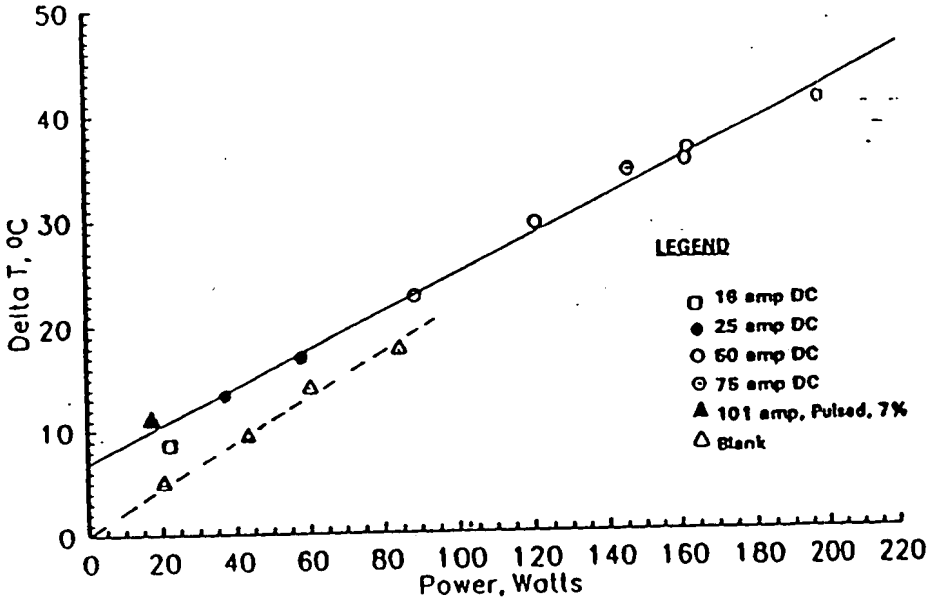
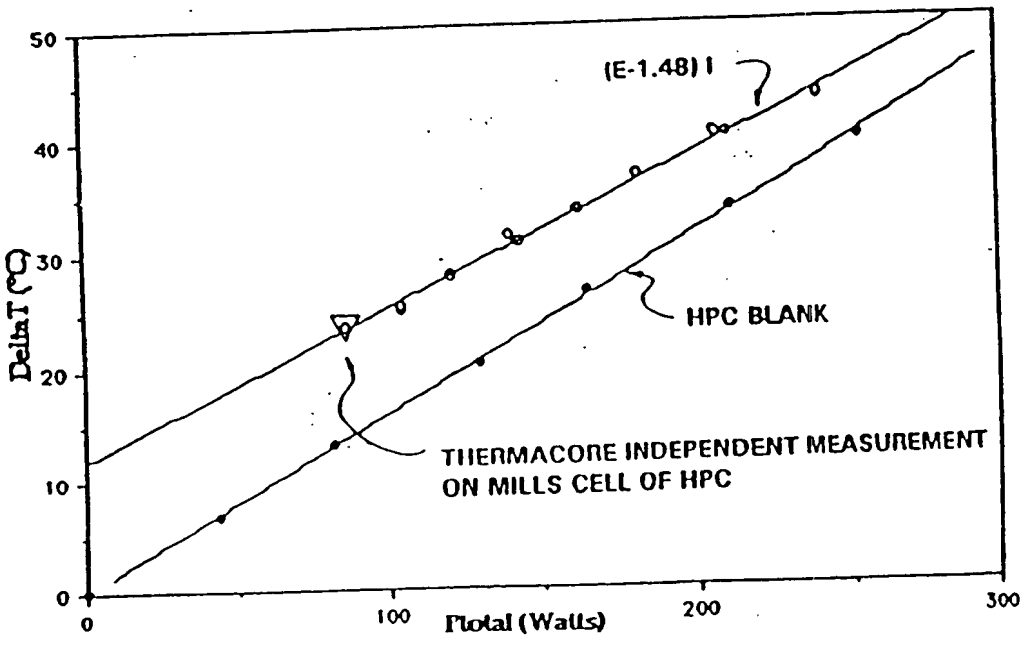


FIGURE 8. HPC DATA FOR 50 AMPERES DC



ower data for an I^2R heated blank of the same geometry as the ell. These data project through zero which is consistent with the athematical modeling of the heat balance.

The theory that led to the discovery of this electrolytic rocess was developed by Dr. Randell Mills, HPC, Lancaster, ennsylvania, as described below:

Dr. Randell Mills has developed a theory for the electro-hemical process discussed herein. This theory is covered by a atent application entitled "Energy/Matter Conversion Methods and tructure", and is described in the Fusion Technology article ntitled, "Excess Heat Production by the Electrolysis of an Aqueous 'otassium Carbonate Electrolyte and the Implications for Cold 'usion" by Dr. Mills and S. Kneizys, the article entitled "A Jnified Theory Derived from First Principles" submitted to the 'hysical Review for publication by Dr. Mills and W. Good, the ırticle entitled "Two Electron Atoms and Elastic Electron ;cattering by Helium", submitted to Physical Review for publication ɔy Dr. Mills and the book entitled, The Grand Unified Theory, by Dr. Mills and Dr. T. Farrell.

In technical terms, under the Mills theory the predominant source of heat is believe to be an electrocatalytically induced reaction whereby hydrogen atoms undergo transitions to quantized energy levels of lower energy than the conventional "ground state". These lower energy states correspond to fractional quantum numbers. The hydrogen electronic transition requires the presence of an energy hole of approximately 27.2eV provided by electrocatalytic reactant(s) (such as PD^{2+}/Li+, Ti^{2+}, or K+/K+), and results in

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4. The cell was disassembled and inspected after over one month of operation at 50 amperes. This inspection showed no visible signs of a reaction between the electrodes and electrolyte. The cell was re-assembled and is operating as before, producing about 50 watts of excess energy, 24 hours a day.

5. Measurements of neutrons were not considered necessary since light water is used in place of deuterium. A scintillation counter was placed next to the cell. No radiation levels above background were detected indicating that nuclear reactions are not involved.

6. Water makeup rates match the Faraday usage plus evaporation. Evaporation was quantified by condensing moisture from the gas effluent, collecting the water condensate, and measuring the condensate rate.

7. Thermacore has taken independent measurements on the original HPC cell using Thermacore equipment. These measurements help confirm the accuracy of HPC data as shown in Figure 8.

8. Results show that heat for a given cell, input power can be reduced while maintaining a constant output power. For example, by pulsing the electrical input at fractional duty cycles the 2 Hz, 100 ampere rectangular wave with a 7 percent duty cycle provides an output/input power ratio of 2.8. This ratio is a factor of 2.5 better than the ratio obtained using straight 75 ampere DC power (See Table 1).

9. As stated in the text above, cell excess power remains almost constant and does not appear to increase significantly at current levels above 25 amperes, DC. The reason for this is not well understood. The HPC theory is that the formation of "shrunken" hydrogen will only occur with the H_1 atom and not the H_2 molecule. The H_1 atom must contact two potassium ions that provide the proper energy hole. This contact may be required to occur on the surface of the nickel electrode; perhaps from H_1 coming out of solution from NiH formed at the surface of the nickel. The rate of H_2 formation relative to the rate of the energy releasing hydrogen atom transition reaction could limit the excess power where excess hydrogen formed at current levels above 25 amperes is lost in the form of H_2.

By: Nelson J. Gernert

Date: 3/10/98

By: Robert M Shaubach

Date: 3-10-98

COMMONWEALTH OF PENNSYLVANIA)
) SS:
COUNTY OF LANCASTER)

On this, the 10 day of March 1998, before me a notary public, the undersigned officer, personally appeared Robert M. Shaubach and Nelson J. Gernert, known to me (or satisfactorily proven) to be the persons whose names are subscribed to the within instrument, and acknowledged that they executed the same for the purposes therein contained.

In witness whereof, I hereunto set my hand and official seal.

Robert Carnevale
Notary Public

NOTARIAL SEAL
ROBERT CARNEVALE, Notary Public
Lancaster, Lancaster County
My Commission Expires Nov. 24, 2001